Groundwater Investigation Report

Desert Diamond
Borrego Springs, San Diego County, CA
TPM 21017, ER 06-05-001

Prepared for the County of San Diego by:

County of San Diego
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1.0 INTRODUCTION

1.1 Purpose of Report

The purpose of this report is to meet the groundwater investigation requirements of the San Diego County Groundwater Ordinance. This investigation provides a summary of groundwater resources within the Borrego Valley aquifer to determine if these resources are capable of meeting the project water demand.

Section 67.720 of the Ordinance specifies that for any proposed project listed in Section 67.711 within the Borrego Valley Exemption Area which either (1) includes a water-intensive use (greater than 20 acre-feet of groundwater per year), or (2) consists of a total project area of 100 acres or more, shall be accompanied by a Groundwater Investigation. Due to the proposed project's size being greater than 100 acres, a groundwater investigation is required for the project. The proposed project will not be approved unless the approving authority finds that based upon the Groundwater Investigation, groundwater resources are adequate to meet the groundwater demands of the project.

1.2 Project Location and Description

Project Location:
The proposed project is located on 169.84 gross acres on Borrego Springs Road within the unincorporated community of Borrego Springs, located in the northeastern corner of San Diego County as shown on Figure 1. The site overlies the Borrego Valley aquifer as shown on Figure 2. Borrego Valley lies within the Colorado Desert geomorphic province just to the east of the mountainous terrain of the Peninsular Ranges geomorphic province.

Project Description
The project is a Tentative Parcel Map and proposes to subdivide a 169.84 gross acre lot into four residential lots and one remainder parcel. The proposed project is proposed to be served by groundwater provided from the Borrego Water District, and individual septic systems will serve each parcel. At the time the project was scoped by the County of San Diego, it was determined that each residential parcel would use on average approximately 0.66 acre-feet of groundwater per year. This was based on the best information available at the time of scoping of residential water use rates in Borrego Valley provided by the Borrego Water District. Based on 0.66 acre-feet per lot, the project's five lots are estimated to use approximately 3.3 acre-feet of groundwater per year. A horse operation is also proposed on the remainder lot which will board approximately 25 horses for six months of the year (winter months) and will use an estimated additional 20 gallons a day for each horse for a total additional water use of 0.28 acre-feet of water per year. The total project groundwater demand from five residential single-family residences and the horse operation is estimated to be approximately 3.58 acre-feet per year.

2.0 EXISTING CONDITIONS

2.1 Physical Setting

2.1.1 Topographic Setting

The project site is located on a gently sloping lot with an average elevation of approximately 600 feet above mean sea level (ft MSL). Borrego Valley covers an area of approximately 110 square miles and ranges in elevation from approximately 1,100 to 1,200 ft MSL around the margins of the aquifer to approximately 450 ft MSL within the vicinity of Borrego Sink (see Figure 2). Approximately 400 square miles of tributary watershed from multiple intermittent creeks and streams drain from the mountains into Borrego Valley, which provide the primary source of groundwater recharge to the Borrego Valley aquifer. The largest surface water inflow occurs along the Coyote Creek drainage entering into the northern portion of Borrego Valley, and another important drainage is Borrego Palm Canyon, where surface water enters into the western portion of the valley.

2.1.2 Climate

Borrego Valley has an arid climate with precipitation averaging approximately 3 to 6 inches in the center of the valley and 6 to 9 inches along the western margins of the valley. Precipitation in the mountainous regions located west of Borrego Valley average from 15 to over 21 inches annually. On average, over 75 percent of the annual precipitation occurs between November and May, and less than 25 percent of the annual precipitation occurs from summer rain and thunderstorms that typically occur from July through September. Temperatures are very hot during the summers with average high temperatures exceeding 105 degrees F, and winters are cool with average lows below 40 degrees F.

Monthly reference evapotranspiration (ETo), which is a measure of potential evapotranspiration (PET) from a known surface such as grass or alfalfa, has been estimated for Borrego Valley to be approximately 71.6 inches per year (DWR, 1999). The ETo rates are highest in July at 9.6 inches, and are lowest in December at 2.2 inches.

2.1.3 Land Use

The land uses in Borrego Valley primarily include residential, agricultural, recreational, and commercial uses. Most of the land is owned by private individuals or corporations. The majority of agricultural lands are located in the northern portion of Borrego Valley. The Anza Borrego Desert State Park and other parkland cover some of the margins of Borrego Valley and the mountain regions above Borrego Valley. Borrego Springs is completely surrounded and

encompassed by State park land which also includes Indian, private, and National forest land.

2.2 Hydrogeologic Setting (Existing Conditions)

2.2.1 Hydrogeologic Units

Initial work by the United States Geological Survey (USGS) indicates that Borrego Valley is filled with up to 2,400 feet of consolidated to unconsolidated sediments resting on basement granitic rocks. Further, the USGS identified three Hydrogeologic units: an upper, middle, and lower aquifer (Moyle and others, 1982; Mitten and others, 1987).

Based upon subsequent study by Dr. David Huntley, the quantity of readily available water in the Borrego Valley exists in the upper and middle aquifer and was estimated to be approximately 2,131,000 acre-feet in 1945 and 1,900,500 acre-feet in 1979 (Huntley, 1993). The Borrego Water District estimated that in 1999 the water remaining in the upper and middle aquifers was approximately 1,685,000 acre-feet (Borrego Water District, 2001). The cumulative depletion of groundwater removed from the aquifer since 1945 is estimated to be greater than 500,000 acre-feet.

The remaining water located within the lower aquifer is more difficult and costly to extract due to its low specific yield (estimated to be approximately 3%), its depth, and low specific capacity (estimated to be 5 gallons per minute/foot of drawdown or less).

2.2.2 Groundwater Recharge

Estimated Recharge

Estimated annual recharge to the Borrego Valley aquifer was initially estimated by the USGS to be approximately 4,800 acre-feet per year (Mitten and others, 1988). The source of recharge was estimated to come primarily from three major drainages: Coyote Creek (approximately 65%), Borrego Palm Canyon and San Felipe Creek (approximately 35% combined). Little recharge, if any from San Felipe Creek benefits users in Borrego Springs as the majority exits Borrego Valley and flows toward Ocotillo Wells.

In a thesis by Netto in 2001, it was estimated that from 1945 to 2000, recharge from groundwater underflow, stream recharge, and bedrock recharge is approximately on average 5,670 acre-feet per year. In a thesis by Henderson in 2001, it was estimated that recharge from 1945 to 2000 averaged approximately 6,170 acre-feet per year. Both estimates showed that recharge had a very large range due to the extremes in rainfall, from very little during dry years to recharge above 50,000 acre-feet in the wettest year.

Age of Groundwater from Borrego Water District Wells

The Borrego Water District in 2001 obtained the age of the water being pumped in two of their pumping wells, well ID 4-11 and well ID 4-18, as shown on Figure 3. Analytical results from water sampled from well ID 4-11 indicated the water to be 873 years old (+- 42 years), and results from water sampled from well ID 4-18 indicated the water to be 1,982 years old (+- 54 years). The results indicate that water in these wells was from not from recent groundwater recharge, but rather from water that percolated and was recharged many hundreds of years ago.

2.2.3 Groundwater Demand

The Borrego Water District has estimated the amount of water used within Borrego Valley from 1950 to 1999. The most recent dataset from 1999 was estimated using records of metered water use for municipal purposes, inspection of irrigated acreage of agricultural land, and reports from golf course operators.

Year	Municipal	Agricultural	Golf Course and Landscape	Total
1950	170	11,435	190	11,795
1958	225	22,455	790	23,470
1962	265	13,455	1,725	15,820
1968	475	7,260	1,720	9,455
1972	530	5,320	2,270	8,120
1978	600	5,705	2,050	8,355
1980	430	10,600	2,100	13,130
1999	2,272	15,590	4,435	22,297

2.2.4 Groundwater Levels

Groundwater levels in Borrego Valley were originally monitored by the USGS as far back as the 1940s. The County of San Diego has been collecting groundwater level data since the early 1980s. Water levels in Borrego Valley have been declining since 1945, indicating a long-term overdraft condition.

Between 1945 and 1980, water levels declined by as much as 100 feet, due to more water being extracted than was being replenished (USGS, 1982).

To provide an understanding of water level trends since the 1980s, water levels from eight wells (see Figure 4 for locations) monitored by the County are summarized in the table below.

Well	Period of Monitoring	Cumulative Drawdown (feet)	Average Change in Water Levels (feet per year)		
			1980s	1990 to 1997	Since 1998
Borrego1	1983-2002	30.6	-1.1	-1.7	-2.3
Empty Irrigation	1987-2006	47.2	-1.5	-2.3	-3.2
Fortiner	1983-2006	55.6	-0.6	-3.4	-3.1
Levie	1986-2005	38.9	-1.0	-2.2	-2.4
State Park 2	1987-2006	49.8	-2.4	-2.2	-3.3
UEC North	1985-2006	26.7	-1.2	-0.5	-2.1
UEC South	1984-2006	24.0	-1.3	-0.5	-2.1
Victor	1983-2001	15.3	-0.9	-0.7	-1.1
AVERAGE OF ALL WELLS			**-1.2**	**-1.7**	**-2.4**

Since the 1980s, water level declines in the 8 wells have ranged from 15.3 feet (Victor well) to 55.6 feet (Fortiner well). Since 1998, water level declines have averaged 2.4 feet per year, which is roughly twice the rate of decline measured in the 1980s. This is likely due to the increased extraction rates that are occurring compared to extraction in the 1980s.

It has been estimated that the volume of groundwater in storage decreases with depth in Borrego Valley. Therefore, it is estimated that basin-wide rates of water level decline will increase with ongoing groundwater mining, even without any change in the deficit between groundwater extraction and recharge.

2.2.5 Groundwater Overdraft Conditions

Since 1945, water levels in Borrego Valley have continually declined in some cases by as much as over 150 feet. Groundwater has and is continuing to be extracted at rates that exceed recharge, which has caused an apparent long-term overdraft condition, also known as groundwater mining. In the past 20 years, rates of decline have increased sharply likely in response to new development and additional groundwater extraction. Dr. Tim Ross of the California Department of Water Resources has estimated the overall rate of overdraft in the aquifer through time as follows:

1980-1989: -4,200 acre-feet per year
1989-2000: -9,100 acre-feet per year
1998-2005: -14,300 acre-feet year

It was estimated that a total of 550,000 acre-feet of water was permanently removed from the aquifer from 1945 to 2005 (Ross, 2006).

The Borrego Water District estimated that in 1999 the water remaining in the upper and middle aquifers was approximately 1,685,000 acre-feet (Borrego Water District, 2001). Based upon the estimation of groundwater storage in 1999, if the overdraft condition continues at the estimated rate of 14,300 acre-feet of water per year, the aquifer would be 50% depleted by 2058, and completely depleted by 2116. However, groundwater overdraft conditions have more than tripled since the 1980s, and continued development without groundwater mitigation measures in Borrego Valley will exacerbate the current overdraft condition. Therefore, without mitigation, the overdraft condition is likely to continually worsen, and the aquifer may be depleted at rates far faster than existing overdraft conditions estimated by Dr. Ross.

It should be understood that groundwater impacts from the overdraft condition are already occurring and will continue to worsen as mining of groundwater continues. Current impacts include decreased well efficiency and increased pumping costs as water levels continue to decline. This will continue and eventually some wells will need to be replaced as water levels drop below perforated levels. Also, water quality impacts may occur as decreased water levels may induce flow of high salinity, poor quality connate water found in deeper formational materials of the aquifer.

3.0 SUMMARY AND CONCLUSIONS

As documented within this report, the Borrego Valley aquifer has a well documented groundwater overdraft condition, where year after year groundwater extraction exceeds the amount of groundwater that is recharged back into the aquifer. In the long-term, this situation is not sustainable. The most recent estimate indicates that 14,300 acre-feet of water are being permanently removed from the aquifer per year and that the overdraft condition is worsening with time as groundwater extraction in Borrego Valley increases. It is also estimated that as water levels continue to drop, the rate of decline will increase since groundwater in storage is estimated to decrease with depth. However, the aquifer does still hold a large volume of groundwater in storage. It was estimated that in 1999, the Borrego aquifer still contained approximately 1,685,000 acre-feet of groundwater in storage. Based upon the current estimated amount of groundwater in storage and existing estimated amount of overdraft as documented in this report, the aquifer may be fully depleted in a little over 100 years. However, since the 1980s the groundwater overdraft condition has more than tripled, and future groundwater use at this pace without groundwater mitigation will very likely cause the overdraft condition to worsen and the aquifer to be depleted in far less time.

3.1 Groundwater Ordinance Compliance

Under the San Diego County Groundwater Ordinance, the proposed project cannot be approved unless the groundwater investigation finds that groundwater resources are adequate to meet the groundwater demands of the project. The proposed project is estimated to use approximately 3.58 acre-feet of water per year, which is a relatively small amount of groundwater compared to other uses in Borrego Valley. Based upon the current estimates of groundwater in storage in Borrego Valley, groundwater resources are currently adequate to meet the groundwater demands of the project. Based on the current rate of overdraft estimated at 14,300 acre-feet per year, there appears to be adequate groundwater resources to meet the demands of the project at least to the year 2030[1].

[1] Long-range regional water resources planning typically project at least 20 years into the future to ensure a reliable water supply. The year 2030 was selected as it reflects the time horizon in the San Diego County Water Authority's Regional Water Facilities Master Plan, which provides water for 97% of San Diego County residents.

3.2 CEQA

This report provides documentation of the already well documented groundwater overdraft condition in Borrego Valley. If new projects propose to use water derived from groundwater in Borrego Valley, they will ultimately contribute to the overdraft condition. It is the cumulative impact of all users that has resulted in the overdraft condition and additional groundwater extraction to support new projects will contribute to this cumulative impact.

As stated in the *DPLU Policy Regarding CEQA Cumulative Impact Analyses for Borrego Valley Groundwater Use* (attached), the Department of Planning and Land Use (DPLU) highly recommends that the applicant include with this project, offsetting groundwater use reduction measures which will make up for the project's proposed groundwater use and result in "no net gain" in the overall rate or amount of extraction of groundwater. This project proposes to use approximately 3.58 acre-feet of groundwater per year from the Borrego Valley aquifer. Therefore, offsetting groundwater use reduction measures must save at least 3.58 acre-feet of groundwater per year elsewhere in Borrego Valley such that there is a "no net gain" in the amount of water extracted from the aquifer. The applicant would have to propose a legally enforceable mechanism for achieving the reduction on the other land. Implementation of the groundwater use reduction measures will mitigate the project's cumulatively considerable impact to groundwater resources.

If the applicant does not propose offsetting groundwater use reduction measures, an EIR will be required to be prepared, to analyze potentially significant cumulative impacts to groundwater resources, to propose feasible mitigation measures, and to consider project alternatives. An EIR is very unlikely to provide evidence that significant impacts to groundwater resources can be avoided without mitigation, and the County would be required to deny the project unless the County determines that economic, legal, social, technological, or other benefits of the proposed project outweigh its unavoidable environmental impacts.

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5.0 LIST OF PREPARERS AND LIMITATIONS

This report provides a summary of groundwater resources in Borrego Valley to meet the requirements for a Groundwater Investigation as required by the San Diego County Groundwater Ordinance. The report was prepared by and for the County of San Diego Department of Planning and Land Use on behalf of the proposed project's applicant. Figures included in this report were prepared by the DPLU GIS department.

At the current rate of overdraft and especially if overdraft conditions continue to increase as it has within the past 25 years, the decline in water levels will continue to result in increasing costs to pump water, and it is possible that impacts including, but not limited to, dry wells and potential water quality impacts from high salinity water within deeper formational deposits may occur in Borrego Valley in the next 20 to 30 years.

For any questions regarding this report, please contact the undersigned.

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Attachment A

DPLU POLICY REGARDING CEQA CUMULATIVE IMPACT ANALYSES FOR BORREGO VALLEY GROUNDWATER USE

A. BACKGROUND

1. Existing Conditions

Water levels in Borrego Valley have been declining for several decades. Groundwater recharge is limited due to the limited precipitation the region receives. The average groundwater recharge for the Valley is estimated to be approximately 5,000 acre-feet per year. The groundwater demand for the Valley exceeds 15,000 acre-feet per year. Due to the difference between supply and demand, the aquifer is currently in an overdraft condition whereby continued extraction at current rates is not sustainable.

However, the aquifer does hold a large volume of water in storage. It was estimated that in 1999 the volume of water in storage was approximately 1,685,000 acre-feet (Borrego Water District, 2001). Water pumped from the aquifer in excess of the natural recharge rate is derived from aquifer storage. Removal of water from storage in the aquifer results in declining water levels in the aquifer. Approximately 500,000 acre-feet of groundwater have been removed from storage over the past 50 years. The County has been monitoring water levels in the Valley for approximately 20 years and has measured declines in the northern part of the aquifer, where most agriculture is located, in excess of 50 feet over that period of time. Current rates of water level decline in some areas of the aquifer are more than 5 feet annually.

If new projects propose to use water derived from groundwater in the Valley, they will ultimately contribute to the overdraft problem. No single user in the Valley is responsible for the overdraft condition. Rather, it is the cumulative impact of all users that has resulted in this condition. Additional groundwater extraction to support new projects will contribute to this cumulative impact. Projects requiring large amounts of water will have a greater cumulative impact on the groundwater resources of the Valley than smaller projects with lower water demands.

The overdraft condition in Borrego Valley is well documented and data collected over the past half century confirms this overdraft condition (Borrego Water District, 2001; Henderson, T.W., 2001; Mitten, H.T., G.C. Lines, C. Berenbrock, and T.J. Durbvin, 1988; Moyle, Jr., W.R., 1988; Netto, S.P., 2001; San Diego County).

2. CEQA Requirements

Projects involving discretionary land use permits or approvals, such as a grading permit, subdivision of land or a major use permit for a golf course, as well as public projects such as general plan amendments, are subject to review under the California Environmental Quality Act (CEQA). As part of this review, the project's potential cumulative impact to groundwater resources (taking the overdraft condition into consideration) must be identified and analyzed.

a. New Proposed Projects. Regarding new proposed projects, State CEQA Guidelines, Appendix G, Section VIII Hydrology and Water Quality, b), requires that the following inquiry be made with respect to groundwater quantity. Would the project:

> *"Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?"*

Additionally, Section XVII, Mandatory Findings of Significance, requires that the following inquiry be made with respect to cumulative impacts:

> *"Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?"*

b. Projects With Previously Approved CEQA Documents. CEQA review of projects for which an Environmental Impact Report (EIR) or Negative Declaration (ND) has previously been approved involves an analysis of whether, due to changes in the project or surrounding circumstances or important new information, there will be new significant effects or increased severity of significant effects, or mitigation measures or alternatives which could reduce the effects but which the applicant declines to implement.

B. POLICY

It is the policy of the Department of Planning and Land Use that CEQA evaluation of potential cumulative impacts to groundwater resources in Borrego Valley will be guided by the following principles:

1. Applicants for projects using groundwater resources in Borrego Valley are encouraged to include with their projects, offsetting groundwater use reduction

measures which will make up for the project's proposed groundwater use and result in "no net gain" in the overall rate or amount of extraction of groundwater.

The offsetting groundwater use reduction measures must save an amount of water at least equivalent to the project's demand amount, elsewhere in Borrego Valley such that there is “no net gain” in the overall groundwater extraction in the Valley. As one example of such a measure, land could be purchased which currently has a water use associated with it. If the water use on this land were reduced by an amount equivalent to the water demand of the proposed project, then there would be “no net gain” in the amount of water extracted from the aquifer, and thus the overdraft condition would not be made worse by the proposed project. The applicant would have to propose a legally enforceable mechanism for achieving the reduction on the other land. An example would be taking agricultural or golf course land out of production.

If the project is proposing single-family residences, any offsetting groundwater reduction measures shall be calculated using 0.95 acre-feet per year as the groundwater demand for each single-family residence. The estimated 0.95 acre-feet per year average demand was derived from analysis of four years of water use data from over 1,300 single-family residences in Borrego Valley (Borrego Water District, 2006).

2. For projects where offsetting groundwater use reduction measures are not proposed as part of the project, except as provided in sections 3 and 4 below, an EIR will generally be required to be prepared, to analyze the significance of cumulative impacts to groundwater resources, to propose mitigation measures, and to consider project alternatives.

The mitigation measures considered in the EIR should include feasible offsetting groundwater use reduction measures as described above in paragraph 1. If the impacts to groundwater cannot be feasibly mitigated or avoided, the County would be required to deny the project unless the County determines that the economic, legal, social, technological, or other benefits of the proposed project outweigh its unavoidable environmental impacts.

3. For projects with previously approved environmental documents, the project must be assessed per the requirements of Section 15162 of the State CEQA Guidelines (summarized at paragraph A.2.b above). If the project proposes to use more groundwater than initially proposed, then offsetting groundwater use reduction measures may be proposed and included in this analysis. If such measures are not included, the Section 15162 analysis may lead to a requirement to prepare a supplemental or subsequent EIR.
If a supplemental or subsequent EIR is required, it should consider feasible offsetting groundwater use reduction measures among the possible mitigation measures.

4. Proponents of some small projects may be able to demonstrate that potential cumulative impacts to groundwater resources are not significant,

because the project's incremental additional groundwater demand is not "cumulatively considerable."

With some projects involving very small groundwater demands, applicants may be able to demonstrate that the incremental groundwater demands of their projects are not "cumulatively considerable." To demonstrate this, applicants should prepare analyses which consider the total water supply available, the number of potential groundwater uses that are likely to be developed in the Valley (based on existing and proposed land use designations), and the gravity of the impact of allowing the small project to go forward. The inclusion of appropriate mitigation measures may also be a basis for a determination that the incremental effects of a project are not "cumulatively considerable."

Revised, January 17, 2007

GARY L. PRYOR, Director
Department of Planning and Land Use

Text

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Second Revision
January 17, 2007

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Figures

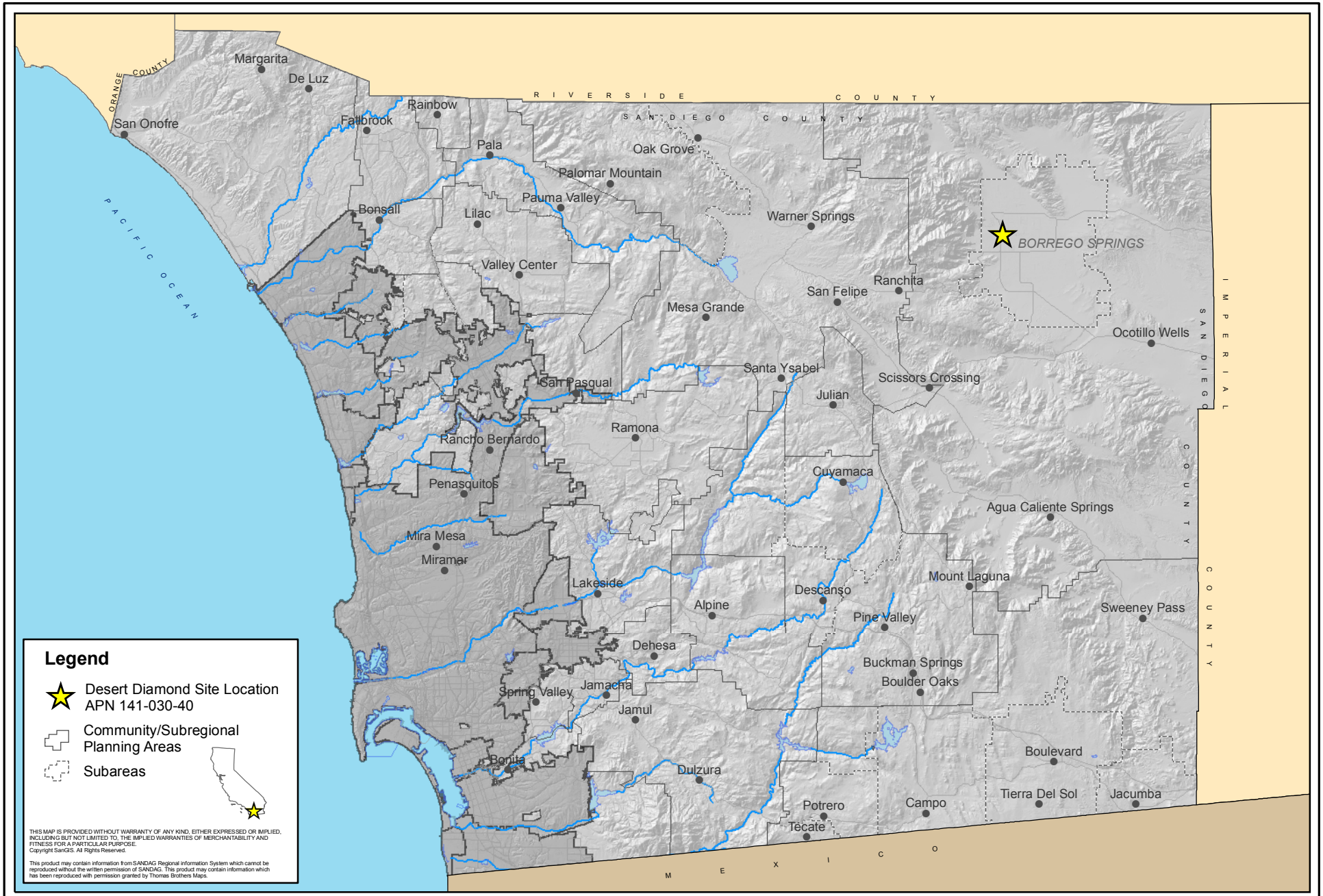

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Figure 1
Desert Diamond
Regional Location Map

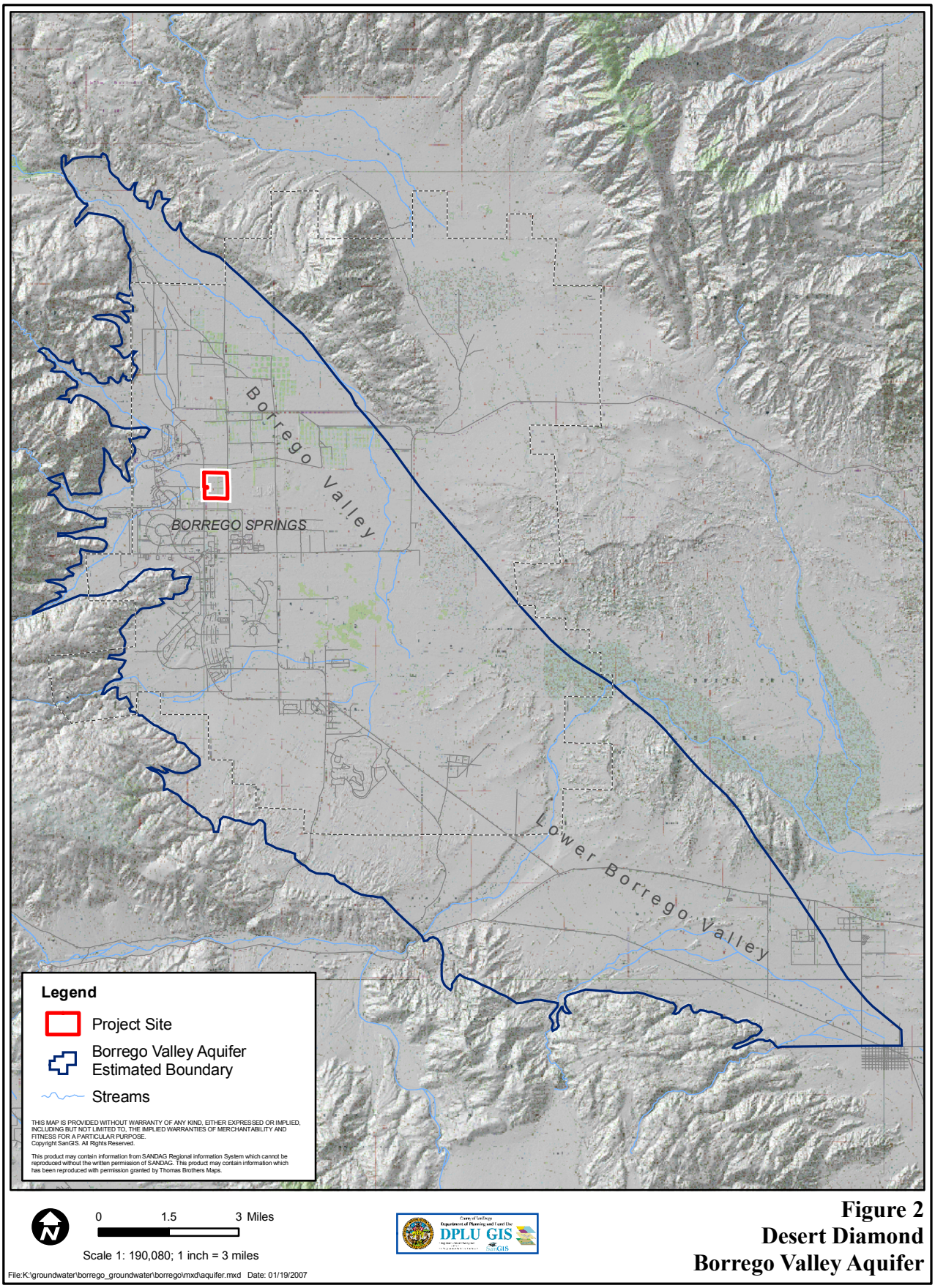
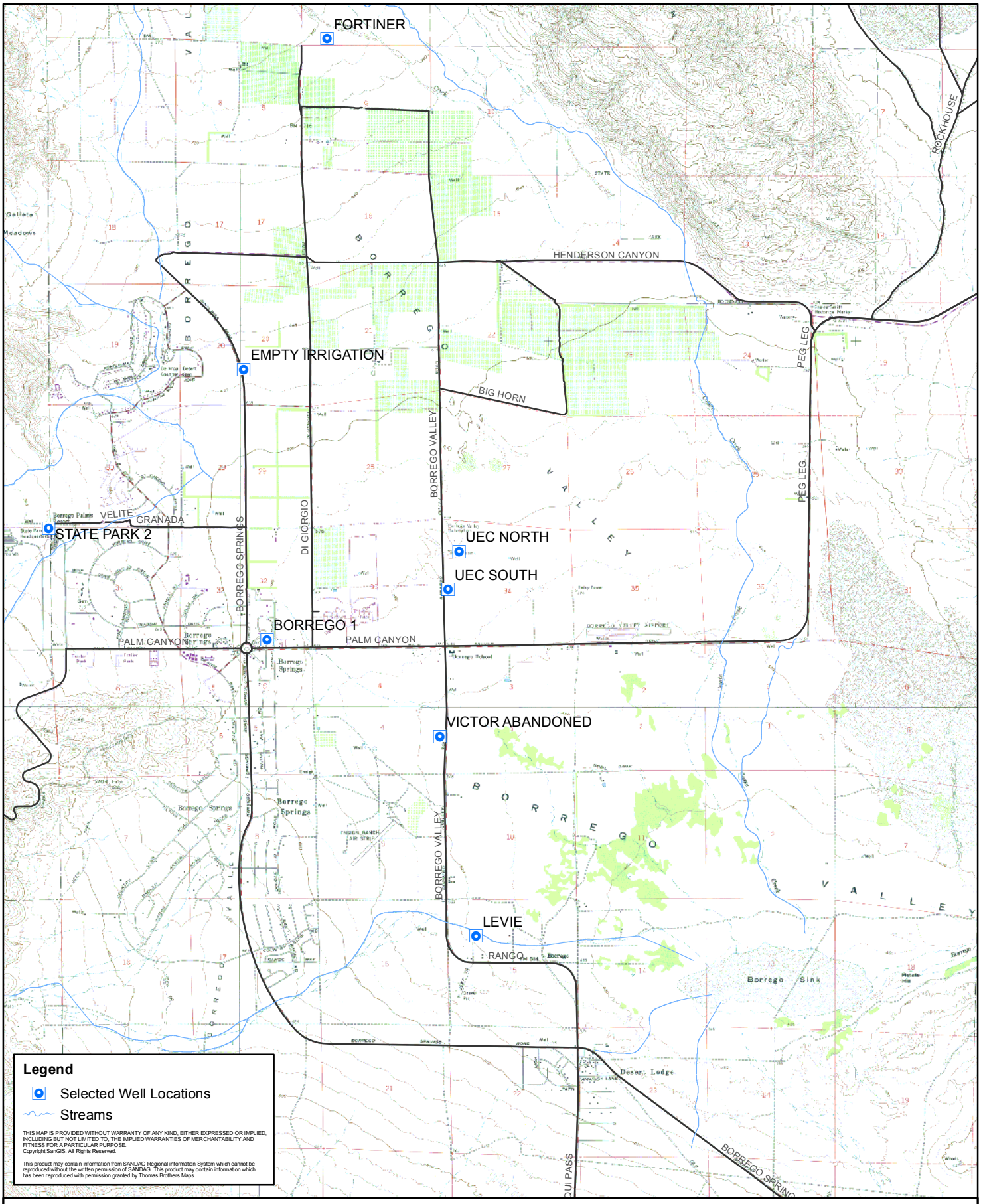


Figure 2
Desert Diamond
Borrego Valley Aquifer



County Monitoring Wells
Borrego Valley
Figure 3

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